Brief Communications

International Telepharmacy Education: Another Venue to Improve Cancer Care in the Developing World

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Abstract

Objective: In developed countries, pharmacists play a crucial role in designing and implementing cancer treatments as part of a multidisciplinary oncology team. However, developing countries have a shortage of pharmacists, and their role is generally limited to dispensing and selling drugs. The aim of this study was to investigate the feasibility of providing clinical pharmacy educational activities via international teleconferencing to improve cancer care in developing countries. **Materials and Methods:** Meticulous preparation and intense promotion of the workshop were done in Egypt before the telepharmacy conferences began. Multiple connectivity tests were performed to resolve technical problems. Nine telepharmacy conferences were delivered during 3-h sessions that were held on three consecutive days. Talks were subsequently made available via Web streaming. Attendees were requested to complete a survey to measure their satisfaction with the sessions. **Results:** The teleconference was attended by a total of 345 persons, and it was subsequently reviewed online via 456 log-in sessions from 10 countries. Technical issues (e.g., poor auditory quality) were resolved on the first day of the event. The rate of attendees' responses on the survey was 30.1%, and satisfaction with the event was generally good. **Conclusions:** Telecommunication is a relatively inexpensive approach that may improve pharmacy practices, especially those used to treat patients with cancer in developing countries. Special attention to patient-based telepharmacy education, including the use of cost-effective technology, should be considered.

Key words: pharmacy, distance learning, telemedicine

Introduction

Pharmacists play a major role in improving healthcare and patient safety while reducing cost, especially for oncology patients.^{1,2} The role of pharmacists as part of the treating team is well established in the developed world.³ However, there is a general shortage of pharmacists in developed countries that is the most critical in rural areas.^{4,5} This shortage has prompted New Zealand to explore compulsory externships in which all pharmacy students would be required to complete part of their training in rural areas.⁶ In the United States, Wisconsin has created new laws that allow the use of telepharmacy for practice as a solution to the pharmacist shortage in that state.⁷ In the developing world, the shortage of clinical pharmacists is even worse, partially because their role is marginalized and their activities are predominantly those of medication dispensers or entrepreneurs.^{3,8}

Oncology is a multidisciplinary field in which pharmacists play an integral role in treatment design and implementation, side effect management, patient safety, supportive care, and patient education.^{1,7,9-11} In addition, the cost of antineoplastic and supportive care drugs is rising. Pharmacists can be gatekeepers and help control that cost while improving efficiency.^{2,7} This is most important in developing countries, where drug costs constitute 25-66% of healthcare expenses; drugs constitute only 10% of healthcare in developed countries.³

The Children's Cancer Hospital 57357 Egypt (CCHE), which opened its doors in Cairo in July 2007, is considered one of the largest pediatric cancer centers in the world; 950 new cases are accepted each year. The CCHE Pharmacy is dedicated to improving care, promoting research, and cutting cost. The International Outreach Program and Pharmaceutical Services at St. Jude Children's Research Hospital (Memphis, TN) agreed to facilitate telepharmacy educational activities to CCHE via videoconferencing. Here we report our experience with emphasis on the quality of the telepharmacy sessions, the perception of the participants, and the savings in cost and time that this event allowed.

Materials and Methods

TELECONFERENCE PREPARATIONS

Before the teleconference, issues such as scheduling, duration of the sessions, and topics were negotiated between the teams at CCHE and St. Jude. Because of the 8-h time difference between Memphis and Cairo, three daily 3-h sessions were more practical than a single 9-h workshop. The agreed-upon time was 5:00 to 8:00 p.m. (Cairo

Table 1. Telepharmacy Topics, Learning Objectives, and Attendance

DAY	TOPIC	LEARNING OBJECTIVES	ATTENDEES (TOTAL)
1	Research	List two examples of pharmacokinetic or pharmacodynamic objectives that may be studied in a clinical trial Give an example of a drug with a known relationship between genetic variation and toxicity	140
	Pharmacy dashboard	Review the rationale for and process used to assemble a "living" data dashboard for use by health system pharmacy leaders at St. Jude	
	Safety	List key milestones in medication safety Describe the features of a high-reliability organization Discuss methods for applying these principles in practice	
2	Order evaluation	Review the many elements of proper pharmacy processing of an order for chemotherapy Emphasize the important safety steps that should be adhered to for optimal handling of these orders	105
	Hyperglycemia	Evaluate the literature on hyperglycemia in the hospital setting Discuss the sequelae associated with transient hyperglycemia in oncology patients Identify patients at risk for transient hyperglycemia Review insulin preparations and activity profile	
	Status epilepticus in neutropenia	Describe the adequate drug selection in status epilepticus Describe the challenges of home management of status epilepticus in neutropenic patients Discuss the use of buccal midazolam for seizure control	
3	Fever and neutropenia guidelines	Provide an overview on practice guidelines currently published in the United States Review key points of drug therapy related to preventing and treating infection in the neutropenic patient with cancer	100
	Zygomycosis treatment	Review the current treatment of zygomycosis and the spectrum of activity and pharmacokinetic properties of posaconazole Describe the application of this treatment approach to a patient case	
	Voriconazole	Review the basic principles of TDM Review published data on the use of TDM for voriconazole for efficacy Discuss the importance of TDM in the prevention of voriconazole-induced toxicities Discuss the results of a pharmacokinetic review of voriconazole in pediatric patients	

TDM, therapeutic drug monitoring.

time), which was 9:00 a.m. to 12:00 p.m. (Memphis time). Topics to be discussed were suggested by the CCHE team with some minor modifications suggested by the St. Jude team. The learning objectives for each topic were determined by the respective speakers (*Table 1*). Finally, permission was obtained from speakers to film their lecture for Web streaming.

Connectivity and other technical issues were tested prior to the conference. The first test with high bandwidth was performed 9 days before the conference. After addressing some of the recognized technical problems, we performed another test 2 days before the conference. A final test was done 30 min before the first telepharmacy session started. The conference was publicized in Egypt and around the world via personal communications (e.g., e-mails), printed material, and online. Talks were available via synchronous and recorded Web streaming.

CONNECTIVITY AND EQUIPMENT

The connection used at CCHE was a symmetric digital subscriber line with 25 megabits per second (Mbps). The videoconference unit

used was a Tandberg (now part of Cisco) MXP 6400. The CCHE auditorium has a capacity of 208 attendees and is covered by two cameras, in addition to a unit-attached camera that was used for preparing the connections before the sessions started. Images from the auditorium cameras were collected and mixed by a video mixer. The video mixer chooses the source and destination screen of the video. Then the mixer provides the videoconference unit with the video source. An audio mixer provided the audio to the videoconference unit. Questions from the local conference attendees were collected using wireless microphones.

Output from the videoconference unit was transferred to the digital versatile disc recorder (DVR) with an internal hard disc drive. The DVR recorded and bypassed the audio/video signals to the previously mentioned video mixer, which transferred the audio and video feeds from the videoconference unit to conference displays, which consisted of two 42-inch plasma screens and one auditorium projector. Another projector was secured to avoid any main projector failures. Video/audio was provided to the streamer/broadcaster (VBrick Systems, Wallingford, CT) through the video mixer, and sessions

were broadcast directly over the conference Web site and recorded on the streamer's hard disk drive.

RCA cables were used. Videoconference units at both sides were connected at a speed of 4,200 kilobits per second to accommodate the available bandwidth. The connection was interrupted twice on Day 1, once on Day 2, and twice on Day 3. Interruptions did not exceed 15 s in duration. Connection was resumed each time without any consequences or changes in the configuration. During discussions, the picture-in-picture view was used, with the presenting side shown in the maximized view.

SURVEY

A questionnaire was developed based on modified online surveys from the Cure4Kids.org Web site,¹² and other questions were added based on previous telemedicine experiences¹³ and eLearningGuild.com synchronous learning evaluation surveys. The online survey was implemented using the open-source survey management application Lime Survey (www.limesurvey.org), after its style was modified for the hospital's corporate identity. The survey was hosted on a Web site prepared for the event. On Day 1, answering all of the survey questions was not mandatory, so some questions were left unanswered. On Day 2, all questions, except the responder's name, were programmed to be obligatory to answer for an attendee to be able to complete the survey. However, it was not mandatory for attendees to take the survey. Browser cookies and Internet protocol (IP) addresses were used to track the respondents. Because the Lime Survey system provides an IP-tracking module, each respondent's IP was tracked to ensure that attendees answered for themselves and that all duplicate responses from anonymous users were removed.

The survey consisted of 19 questions that addressed the following topics: session quality (topic, presenter, audiovisual, equipment, and technical support), impact on practice, general satisfaction, request for general suggestions, and miscellaneous (e.g., session name, personal name, and whether the person would recommend or participate in such activities again in the future). The survey was done electronically and was available for 2 weeks after the last session.

Results

ATTENDANCE AND RESPONSES

In total, 106 surveys were completed. Of these, two were excluded because no information was provided, so 104 surveys were evaluable. We also documented a total of 456 online log-ins from 10 countries to review the sessions. Most of the responses (84 [80.8%]) were completed within 3 days of the last session, and the rest (20 [19.2%]) were completed within the following 11 days. It should be noted that the percentages were calculated for each day separately (Table 2).

EFFECTIVENESS OF THE SESSIONS

The majority of attendee responses indicated that the sessions will influence their practice ($n=93$), will improve their patient care ($n=82$), will improve treatment outcomes ($n=91$), met their educational needs ($n=78$), reinforced their current practice ($n=87$), and

Table 2. Attendance and Survey Response Rates

DAY	NUMBER OF		
	LOCAL ATTENDEES	ONLINE LOG-IN SESSIONS	SURVEYS COMPLETED (%) ^a
1	140	126	38 (27.1)
2	105	203	36 (34.3)
3	100	127	30 (30.0)
Total	345	456	104 (30.1)

^aSurveys were completed by local attendees only, and 80.8% were completed within 3 days of the last telepharmacy session.

met the stated objectives ($n=85$). Most attendees indicated no evident commercial bias and/or influence ($n=59$), but some were uncertain ($n=29$). When asked about their commitment to making changes in their practices, many were committed to implementing these changes ($n=74$). Some reported a desire to change for their practice but cannot because of various limitations, including administrative issues ($n=26$), practice issues ($n=30$), lack of resource issues ($n=10$), policy issues ($n=3$), or financial reasons ($n=15$).

EFFECTIVENESS OF THE PRESENTERS

Most attendees were satisfied with the presenters' knowledge of the subject ($n=95$), meeting the stated learning objectives ($n=91$), and method of presenting information ($n=88$). There were many attendees who had never participated in telepharmacy sessions ($n=87$). Many indicated satisfaction with the presenter who led the discussion ($n=85$) and with their opportunity to ask questions ($n=82$).

PREPARATION AND MATERIAL QUALITY

Most attendees were satisfied with the information they received prior the videoconference ($n=90$), the video quality ($n=85$), and the audio quality ($n=64$). Some attendees were not satisfied with the audio quality ($n=17$), while some were not sure ($n=22$). Satisfaction with equipment was good ($n=82$), as well as that with the room ($n=94$) and technical support ($n=95$). Nearly a third (28.9%) of the attendees reported dissatisfaction with the background noise that occurred on Day 1 (discussed below).

ATTENDEES' SUGGESTIONS

Some attendees suggested allowing more time for questions ($n=21$), showing more visual examples ($n=19$), and allowing more interaction between the presenter and attendees ($n=19$).

MARKETING SUCCESS

When asked how they learned about the teleconference, the attendees responded as follows: word of mouth ($n=28$), printed material ($n=22$), e-mail ($n=14$), and Internet search ($n=13$).

TECHNICAL PROBLEMS

Two weeks prior to the workshop, we identified interference with Internet functions requiring bandwidth caused by e-mails, broadcasting, and regular Internet browsing. To overcome this interference, the Internet bandwidth at CCHE was increased from 10 to 25 Mbps. Another problem faced during the testing was that any changes in the St. Jude real IP of the videoconference machine or gateway required that CCHE register the new IP addresses at their firewall to accept the connection and route it to their videoconference unit.

On Day 1, the level of background noise was very high. Different methods of noise reduction were attempted using an auditorium-equalizer facility with little improvement, and the problem persisted throughout the session. On Day 2, we discovered that the source of the background noise was the echo-reduction option on the CCHE videoconference unit. When this option was turned off, the audio became very clear. However, the microphone at CCHE had to be turned off during the presentation to avoid the echo. Thus, when an attendee at CCHE posed a question, that microphone was switched on, and the microphone at St. Jude had to be turned off. Attendees' satisfaction with the audio quality was preserved throughout the rest of the workshop.

Discussion

Knowledge sharing using advanced telecommunication strategies has been successful in accomplishing diverse educational and economic activities, including adult and pediatric oncology. Applied to oncology, it has improved cancer care in the developing world. To date, most of these teleinteractions have involved diagnostic and therapeutic procedures but not pharmacy practices.¹⁴ To our knowledge, this is the first reported experience of an international telepharmacy educational symposium in pediatric oncology. Most cancer burden in the future will be in developing countries¹⁴; thus, integrating pharmacy activities into oncology practices will improve care and decrease cost.^{2,7} This goal is crucial in developing countries because drugs constitute a significant portion of the healthcare cost there.³

Telemedicine has the potential of saving money and time by decreasing the need to travel.¹⁵ The airfare for one speaker to travel from Memphis to Cairo during the period of the teleconference was approximately \$3,000 (U.S.), and the cost of hotel accommodation in Cairo for 3 nights would have been about \$570 (U.S.). By using videoconferencing, CCHE saved nearly \$25,000 (U.S.). This amount does not include the honorarium usually paid to speakers by the hosting institute or the number of working days saved by St. Jude. Round-trip travel from Memphis to Cairo is approximately 42 h; thus, the seven St. Jude speakers saved in total 294 h of travel time.

Our study provides evidence of the success of an international experience of telepharmacy. This success is evident in the attendance and number of times the programs were reviewed online. Such attendance was made possible because of the dynamic marketing of the telepharmacy workshop via different methods such as e-mails, online

announcements, printed material, and word of mouth. Except for poor audio quality on the first day, the attendees were generally satisfied with the content, preparation, and technical support. This success was due to the meticulous preparation and multiple technical tests done prior to the telepharmacy sessions. This technical success would not have been possible without the human factor and local institutional support that are crucial for any telemedicine activity to thrive.¹⁴

Many CCHE pharmacy colleagues and those from other CCHE departments, including two of the co-authors (S.K. and S.A.), have visited St. Jude since the establishment of our International Outreach Program partnership with their institution. Thus, to establish a sustainable telepharmacy program, it is best to incorporate it as part of a larger twinning/collaboration initiative.

We must note that the general satisfaction reported in the survey could be overestimated because of the low response rate of around 30%. Attendees who had positive feedback to offer responded, and those who were dissatisfied may have elected to not fill out a survey. Many of the suggestions offered by attendees focused on allowing more time for interaction with the speaker and more time for questions. These suggestions will be considered in the planning of future telepharmacy activities to alleviate the anxiety of the attendees and compensate for the lack of the speaker's physical presence.

Finally, we must emphasize that we are not proposing that telepharmacy is the solution for all pharmacy problems and deficits in developing countries or underserved populations in the developed world, but rather we suggest that it is a method to be explored in a systemic approach. Providing seminars may not necessarily improve patient care, but a patient-focused approach complements the knowledge gained during the telepharmacy sessions and may benefit patients in real time.¹⁶ Also, other methods of telemedicine that are less expensive than videoconferencing (e.g., www.Cure4Kids.org or Skype) should also be considered, if they can achieve the defined goals.

To improve patient care, the pharmacy teams from CCHE and St. Jude have started holding regularly scheduled online meetings that are mainly dedicated to actual cases at CCHE. The teams are conducting these meetings via the Cure4kids Web site (www.Cure4Kids.org). The meetings may facilitate the application of knowledge gained during these interactions into clinical practice. Further follow-up work could include surveying the CCHE attendees to learn whether they have implemented changes or improved their practice based on the telepharmacy symposium and online follow-up meetings.

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Disclosure Statement

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